SECTION 02717 - CONCRETE SEWER REHABILITATION BY MACHINE-WOUND PVC PIPE

City of San Diego, CWP Guidelines

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NTS: This Guide Specification addresses the use of the Rib Loc System from Preussag Pipe Rehabilitation, Inc., to repair surfaces in sewers equal to and larger than 6 inches diameter.

There is no known equal at this time.

From closed circuit TV or visual inspections, selection will be made between "partially deteriorated" and "fully deteriorated" host pipe conditions. "Partially deteriorated" pipe may have some longitudinal cracks and distortion of the diameter but can support all soil and surface loads. Soil adjacent to the pipe can provide adequate lateral support. "Fully deteriorated" pipe has insufficient structural capacity to support soil and surface loads due to missing sections, loss of original pipe shape, severe, complete corrosion, or the pipe is expected to reach such conditions during the design life of the rehabilitation.

Paragraph 6.1A of ASTM F 1741 has some useful information on the significance of obstructions.

The Specifier must select from optional requirements which are based on 3 Rib Loc products in this Section. These are: (1) Expanda Pipe, (2) Slipliner, and (3) Ribsteel. Expanda Pipe (6 to 30 inches diameter) is wound and slipped into the host pipe in one operation, then expanded against the walls of the host pipe. Slipliners from 9 to 40 inches diameter are simply wound to a fixed diameter and slipped into the host pipe in one operation. The annular space between the OD of the Slipliner and the ID of the host pipe is then grouted. Finally, the Ribsteel product (24 to 100 inches diameter) is wound to a fixed diameter and slipped into the host pipe similar to the Slipliner product except that a steel stiffener strip is wound on the outside of the pipe. The stiffener strip creates a pipe with stiffness equal to the host pipe when it was new. Grouting is needed to transfer loads to the wound pipe from the surrounding soil.

The Drawings must show the required inside diameter if a grouted annular space inside the host pipe is required.

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PART 1 -- GENERAL

1.1 WORK OF THIS SECTION

A. The WORK of this Section includes providing restoration to sewers at locations indicated on the Drawings. Restoration shall employ a machine-wound PVC profile wall pipe [behind which grout is placed].

B. The WORK of this Section requires that materials and installation procedures be from Preussag Pipe Rehabilitation, Inc. No substitutions will be considered.

1.2 STANDARD SPECIFICATIONS

A. Except as otherwise indicated in this Section of the Specifications, the CONTRACTOR shall comply with the Standard Specifications for Public Works Construction (SSPWC), as specified in Section 01090 - REFERENCE STANDARDS.

1.3 REGULATORY REQUIREMENTS

A. The WORK of this Section shall comply with the current versions of the following:

1. Construction Safety Orders, Division of Industrial Safety, State of California.

2. California Department of Transportation Traffic Manual

1.4 SPECIFICATIONS AND STANDARDS

A. Except as otherwise indicated, the current editions of the following apply to the WORK of this Section:

ASTM C 39	Test Method for Compressive Strength of Cylindrical Concrete Specimens
ASTM C 109	Test Method for Compressive Strength of Hydraulic Cement Mortars (Using 2 inch or 50 mm Cube Specimens)
ASTM C 172	Practice for Sampling Freshly Mixed Concrete
ASTM D 1784	Rigid Poly (Vinyl Chloride)(PVC) Compounds and Chlorinated Poly (Vinyl Chloride) (CPVC) Compounds
ASTM F 1697	Poly (Vinyl Chloride) (PVC) Profile Strip for Machine Spiral-Wound Liner Pipe Rehabilitation of Existing Sewers and Conduits
ASTM F 1741	Standard Practice for Installation of Machine Spiral-Wound Poly (Vinyl Chloride) (PVC) Liner Pipe for Rehabilitation of Existing Sewers and Conduits

1.5 SHOP DRAWINGS AND SAMPLES

A. The following shall be submitted in compliance with Section 01300:

1. Lining system material identification and construction details, including method of joining adjacent edges.

2. Certified laboratory reports from chemical resistance tests of PVC strip and sealant.

3. Reports of results from testing of representative strip material for the following, according to ASTM F 1697.

a. Profile dimensions

b. Pipe stiffness
c. Joint tightness
d. Internal pressure holding capacity
e. Vacuum holding capacity

4. Manufacturer's application instructions, including details of seams and terminations, Material Safety Data Sheets, maximum storage life and storage condition requirements, mixing and proportioning requirements, environmental requirements for worker safety such as ventilation, humidity, and temperature.

5. Design calculations showing that the proposed pipe stiffness satisfies the structural requirements of the host sewer.

6. Grout formulation, including curing time and verification of compressive strength,

7. Grouting plan, including description of equipment and injection points.

6. Proof of applicators' licensure by the manufacturer.

7. A written verification at least 2 days before commencing rehabilitation that the sewer is free of obstructions and debris and is in suitable condition for repairs.

1.6 APPLICATOR QUALIFICATIONS

A. The CONTRACTOR or subcontractor performing the WORK of this Section shall be licensed by the manufacturer.

PART 2 -- PRODUCTS

2.1 GENERAL

A. Rehabilitated host pipe shall be leakproof under a minimum external hydrostatic pressure [of 15 feet of water above the top of the pipe.][equal to the lateral pressure of saturated soils outside the pipe wall.]

2.2 MATERIALS

A. **PVC Profile Strip**

1. The strip shall be made from unplasticized PVC compounds having cell classification 13354-C in accordance with ASTM D 1784. Strip shall have successfully passed the chemical resistance tests in SSPWC Subsection 210-2.3.3. The steel reinforcing profile shall be Type 316L stainless steel.

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NTS: Delete the optional sentence in the first set of square brackets in paragraph 2.2A2 below if Ribsteel is the only product in the project. ASTM F 1697 does not include pipe stiffness for the Ribsteel product.

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2. Stiffness: [Profile strip shall have width, thickness, and profile height dimensions as listed in ASTM F 1697.] Profile dimensions shall be selected to provide an adequate pipe stiffness with a safety factor of 2.0 for [partially deteriorated][fully deteriorated] host pipe condition as defined in the appendix of ASTM F 1741. The CONTRACTOR shall submit calculations showing the pipe stiffness of the proposed profile dimensions satisfies this requirement.

3. Profile strip shall be homogeneous and free from visible cracks, holes, foreign inclusions, and other defects. It shall be uniform in color, density, and dimensional properties.

4. Acceptance: Material from production runs will be considered defective where the tested pipe stiffness does not meet or exceed the corresponding value in ASTM F 1697 Table 1 or the joints do not pass the pressure and vacuum tests.

B. **Sealant:** Sealant for joints shall be resistant to attack by hydrogen sulfide and strong acids and bases. Sealant shall be as recommended by the system manufacturer.

C. **Grout:** The grout shall consist of portland cement, water, flyash or lime, and admixtures. Dispersant may be added to lower the viscosity for increased pumpability. The formulation shall be submitted by the CONTRACTOR to the CONSTRUCTION MANAGER prior to starting the work. Grout components shall be clean, fresh and stored in a dry condition. Premixed grouts, if used, shall be used in accordance with the manufacturer's specification. All grouting equipment shall be kept clean and free of grout buildup.

PART 3 -- EXECUTION

3.1 PRODUCT, DELIVERY, STORAGE, AND HANDLING

A. Strip shall be shipped on reels as needed to protect the material from damage during transport. Strip shall be plainly labeled to show manufacturer's name, production code, date of manufacture, profile type, cell classification, and ASTM standard number.

B. Stored materials shall be protected from excessive heat, cold, and weathering. Profile strip shall be protected from debris contamination. Profile strip shall be handled so that no kinks, gouges, or other defects develop. Damaged strip shall be removed from the Site and be replaced at no additional cost to the OWNER.

3.2 WORKING CONDITIONS

A. The CONTRACTOR is hereby notified that the sewer is a permit required confined space.

B. Wastewater will continue to flow through the sewer during rehabilitation, and the CONTRACTOR shall be prepared to perform Work during prevailing flow conditions in the sewer or to divert the sewage as indicated below. Rehabilitation operations shall not be performed if weather conditions are such that anticipated wastewater flows can exceed diversion pumping capacity or depths that permit proper and safe work within the sewer. Operations shall be conducted only when the wastewater level in the pipe is at a minimal depth.

C. The CONTRACTOR shall employ means and methods which prevent blockage and minimize surcharge of wastewater in upstream manholes and tributary pipelines.

3.3 DIVERSION PUMPING

A. Install and operate diversion pumping equipment to maintain sewage flow and to prevent backup or overflow.

B. Design all piping, joints, and accessories to withstand twice the maximum system pressure or 50 psi, whichever is greater. A spare pump and piping shall be at the Site, ready for use in case of a breakdown.

C. In the event of accidental spill or overflow, the CONTRACTOR shall immediately stop the overflow and shall take action to clean up spillage and disinfect the spill area to the satisfaction of the CONSTRUCTION MANAGER.

3.4 CLEANING AND SURFACE PREPARATION

A. **Cleaning and Debris Removal**

1. Prior to cleaning the concrete surfaces and installing the new liner systems, the CONTRACTOR shall remove all accumulated debris, foreign materials, and corrosion products and dispose of it in compliance with all Federal, State and local regulations. Debris includes sludge, dirt, sand, rocks, grease, roots, and other solid or semi solid materials.

2. The CONTRACTOR shall employ suitable equipment to collect all debris dislodged during cleaning operations. At a minimum, debris shall be removed prior to the end of each day and shall be disposed of daily at an approved off-site location. Hauling containers shall be watertight.

[3. Active leaks which will affect quality of grouting shall be sealed by application of hydraulic plug material.]

3.5 INSPECTION

A. The CONTRACTOR shall inspect the sewer surface to determine the nature and location of obstacles or protrusions which prevent or will adversely impact the quality of the liner. Such obstacles and protrusions shall be removed.

3.6 INSTALLATION

A. **Fabrication and Insertion:** The CONTRACTOR shall use a manufacturer-supplied machine to spirally wind and lock the profile strip to form a pipe and push the pipe thus formed into the host pipe. Sealant shall be placed at the proper location on the locking ribs. [Steel reinforcement shall be wound onto the outside of the pipe and locked into place.]

[B. **Expansion:** The CONTRACTOR shall pull the wire out of the expandable joint and apply torque to the pipe to expand it outward against the inner surface of the host pipe. The ends of the pipe shall be sealed to the walls of the manholes at each end of the pipe.]

3.7 GROUTING

A. **General:** The entire annular space between the outside of the liner pipe and the inside of the host pipe shall be grouted in strict accordance with the liner pipe manufacturer's instructions. Grouting of the annular space shall be done in such a manner as to prevent bulging, deformity, damage, or collapse of the liner pipe. The grouting pressure shall not exceed 10 psi nor the maximum allowable pressure recommended by the liner pipe manufacturer.

B. **Bulkheads**

1. The CONTRACTOR shall seal the upstream and downstream ends of the annular space between manholes using material acceptable to the liner pipe manufacturer.

2. The upstream bulkhead shall have two vents at the crown. The vents shall allow air to be displaced out of the annular space by the grout. In addition, grout holes may be drilled in the PVC lining at appropriate points and grout pumped into them until satisfactory fill is obtained. Grout holes in the PVC liner and vent holes in the bulkhead shall be sealed with PVC plugs.

3. Grouting may be done in a single continuous operation or in lifts.

4. Vents at the crown shall be plugged after placing the final lift.

3.8 FIELD TESTING

A. The liner will be inspected by the CONSTRUCTION MANAGER for [proper embedment in grout,] air pockets, edge or seam defects, rips, tears, and punctures. Defects shall be removed, replaced, and retested.

3.9 CLOSED CIRCUIT TELEVISION INSPECTION

A. Sewer surfaces shall be inspected by closed circuit television (CCTV) to document the condition of rehabilitated surfaces in accordance with Section 02735.]

** END OF SECTION **